The Use of Platelet-Rich Fibrin Versus Subepithelial Connective Tissue Graft in Treatment of Multiple Gingival Recessions: A Randomized Clinical Trial

Elif Öncü, PhD, DDS[1]

The objective of this study was to evaluate the clinical effectiveness of platelet-rich fibrin (PRF) membrane used in combination with a modified coronally advanced flap (MCAF) and to compare it with the use of a subepithelial connective tissue graft (SCTG) in combination with a MCAF in treatment of Miller Class I and II bilateral multiple gingival recessions. A total of 20 patients with multiple Miller Class I and II maxillary gingival recession defects participated in this randomized, split-mouth, controlled study. A total of 60 defects received either PRF + MCAF (test group, n = 30) or MCAF with SCTG (control group, n = 30). Gingival recession depth (RD), keratinized tissue width (KTW), probing depth (PD), clinical attachment level (CAL), and gingival thickness (GT) were evaluated at baseline and after 6 months. Patients' discomfort postsurgery was measured by comparing visual analog scale scores. The percentage of root coverage was 84% in the control group and 77.12% in the test group (P = .007). Complete root coverage of the control and test groups was 60% and 50%, respectively (P = .112). KTW and GT increased in both groups from baseline to 6 months (P < .001). At 6 months postoperative, KTW was greater in the control group (P = .024) and GT was higher in the test group (P = .005). Use of a PRF membrane in gingival recession treatment decreased postoperative discomfort compared to SCTG-treated gingival recessions (P < .001). Within the limitations of the present study, it was concluded that localized gingival recessions could be successfully treated with MCAF + PRF as well as MCAF + SCTG. The PRF technique has the bonus advantage of being more comfortable during the postoperative period. The author suggests that the use of PRF is a valid alternative to SCTG for the treatment of localized gingival recessions.
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[1]Assistant Professor, Necmettin Erbakan University Department of Periodontology, Konya, Turkey.

Correspondence to: Dr Elif Öncü, Necmettin Erbakan University Department of Periodontology, Karaciğan Mah Ankara Cad No. 74, A Karatay, Konya, Turkey. Fax: 0332 220 00 45. Email: oncu.elif@hotmail.com

Gingival recession is exposure of the root surface due to apical migration of the gingival margin. It is a common problem in the general population and often leads the patient to seek treatment.[1–3] Mucogingival therapy may be required to prevent further recession, correct esthetic problems, aid plaque control, and reduce dentin hypersensitivity.[4–6] In the last 30 years, various surgical procedures have been used to treat gingival recession defects. These include laterally positioned flap, free gingival graft, coronally advanced flap (CAF), subepithelial connective tissue graft (SCTG), and guided tissue regeneration with membranes, acellular dermal matrix (ADM), platelet-rich plasma (PRP), and platelet-rich fibrin (PRF) in combination with CAF.[7–9]

CAF with SCTG is accepted as the gold standard[7] and has shown greater predictability for obtaining complete root coverage. However, the SCTG technique has some disadvantages. It is time consuming, increases morbidity, requires a second surgery, and leads to postoperative pain and bleeding, and the supply of donor tissue is limited.[8–13]

PRF is a second-generation platelet concentrate prepared from centrifuged blood. It is a modification of PRP and has some advantages, such as ease of preparation/application, minimal expense, and

lack of biochemical modification (no bovine thrombin or anticoagulant is required). Because of PRF's natural fibrin framework properties, growth factors can maintain their activity for a relatively longer period and effectively stimulate cell migration, wound healing, and tissue regeneration.[14,15] Recent studies have demonstrated that PRF has a significant slow, sustained release of key growth factors for at least 1 week[16] and up to 28 days, which means that PRF could stimulate its environment for a significant time during wound healing.[17] It activates the vascular system and releases growth factors involved in soft tissue healing.[14,17] PRF also contains a large quantity of platelet and leukocyte cytokines, which can play a significant role in the self regulation of inflammatory and infectious phenomena.[14,17] PRF membrane has mechanical adhesive properties and biologic functions such as fibrin glue; it maintains the flap in a stable position and enhances angiogenesis.[18] It is easy to produce and inexpensive, and it can be prepared in a short time.[19]

The objective of this study was to evaluate the clinical effectiveness of PRF membrane used in combination with a modified coronally advanced flap (MCAF) and to compare it with the use of a SCTG in combination with MCAF in Miller Class I and II bilateral gingival recession treatment.

Patients and Methods

All patients were recruited from Necmettin Erbakan University, School of Dentistry, Department of Periodontology, Konya, Turkey. All selected patients gave full written informed consent in accordance with the Helsinki Declaration, and the study protocol was approved by the local ethics committee (clinical trials number NCT02335866).

The selected patients had esthetic concerns due to gingival recessions. A total of 60 sites in 20 patients (9 men and 11 women, aged 20 to 60 years, median age 40 years) were selected based on the following inclusion criteria: good systemic and periodontal health; no smoking habit; similar bilateral Miller Class I or II[20] localized gingival recessions of at least 3 mm located on incisors, canines, or premolars on both jaws; identifiable cementoenamel junction (CEJ); age ≥ 18 years; presence of tooth vitality and absence of restorations and superficial caries in the area to be treated; no previous periodontal surgical treatment on the involved sites; sufficient palatal donor tissue of at least 2.5 mm thickness for the indicated SCTG. Patients who were pregnant or lactating or had a self-reported history of antibiotic medication within the past 6 months were excluded. Molar, mobile, or fully restored teeth were also omitted.

The study was designed as a split-mouth, randomized, controlled clinical trial. Maxillary bilateral gingival recession defects were randomly assigned to the test (MCAF + PRF, n = 30) or control (MCAF + SCTG, n = 30) group (Fig 1). Randomization was done by coin flip on the operation day, immediately before the surgery.

Clinical measurements were taken at baseline and at 6 months postoperative. The measurements assessed probing depth (PD), clinical attachment level (CAL), and gingival recession parameters including recession depth (RD), keratinized tissue width (KTW), and gingival thickness (GT). PD, CAL, RD, and KTW values were recorded using a Williams probe (Hu-Friedy) and rounded up to the nearest millimeter. To standardize the clinical measurements, acrylic stents were prepared on patients' casts. An acrylic stent that covered the occlusal surfaces of the experimental tooth was used as a reference point. The acrylic stent in position with the periodontal probe was inserted into the crevicular area at the angle necessary to reach the deepest area of the defect. Longitudinal grooves were then made on the stent with burs. Using the grooves as guides for periodontal probe, all measurements were recorded at the midbuccal point of the teeth at baseline and 6 months after surgery. GT was measured 3 mm below the gingival margin, under topical anesthesia and using an endodontic reamer with a rubber stopper.

RD was measured from the CEJ to the gingival margin. KTW was recorded as the distance from the mucogingival junction to the gingival margin. Duplicate measurements were made for RD and KTW with an interval of 24 hours, and the average value of two measurements was used for the assessment.

All patients received oral hygiene instructions and were motivated to maintain their oral health to eliminate habits related to the etiology of the gingival recession.

Professional tooth cleaning was performed if needed. The patients were given a visual analog scale (VAS) for self-evaluation of the discomfort during the first postoperative week.

Root coverage was defined as the decrease in RD between baseline and 6 months postoperative. Complete root coverage was described as complete closure of RD by 6 months after the operations.

Fig 1 *Preoperative view.* (left) *Test side.* (right) *Control side.*

Fig 2 (left) *Flap design.* (right) *Prepared PRF.*

Graft Preparation

PRF Preparation

Blood samples were taken with a 24-gauge needle from the antecubital vein. Samples were collected in 9-mL glass-coated plastic tubes without anticlotting agent (Vacutainer, Becton Dickinson) and immediately centrifuged at 2,700 rpm for 12 minutes with a table centrifuge (PC-02, Process). The fibrin clot formed in the middle part of the tube was taken, and the remnants of red blood cells were scraped off with gauze. The clot was transferred to the PRF box and compressed, and PRF membranes were obtained.

SCTG Harvesting

The palate donor area was measured with a periodontal probe to be certain that the soft tissue thickness was at least 3 mm. The aim was to remove a 1.5-mm-thick graft. The donor area was usually in the area palatal to the maxillary first molar, to the maxillary canine. Two parallel incisions were made in the palate, staying at least 2 mm away from the tooth margin. Vertical releasing incisions were used to obtain the SCTG from the palate with a no. 15 blade as described previously,[21] and the donor site was sutured. All SCTGs completely covered the recession defects.

Surgical Protocol

All surgeries were performed by the same surgeon. After root planing, recession defects were scaled using Gracey curettes. An MCAF technique (Fig 2) was used as described by Zucchelli and De Sanctis.[22] All operations were done with microsurgical instruments (Hu-Friedy) and ×3.5 magnifying loupes (Zeiss). The flaps were prepared as follows: submarginal incisions were made in the interdental areas, and intrasulcular incisions were made around teeth with recession defects. Split full-thickness flap incisions were performed in the coronal-apical direction. Vertical releasing incisions were not made (Fig 2). The papillae adjacent to the involved tooth were de-epithelialized to create a connective tissue bed. At the surgical sites, the previously prepared PRFs or SCTGs were placed over the recession defects, leaving the coronal margin of the graft at the CEJ (Fig 3). All SCTGs and PRFs completely covered the recession defects and slightly extended mesiodistally. All graft materials were sutured to the periosteum with 5-0 resorbable sutures. The flap was relieved by incising the periosteum and repositioned coronally without tension, with its margin located on the enamel, and the wound was closed with 5-0 resorbable sutures. Hemostasis was achieved by the application of gentle finger pressure for 4 minutes.


Fig 3 *Intraoperative views after* (left) *PRF and* (right) *SCTG were placed and sutured.*


Fig 4 *Postoperative view after 6 months.* (left) *Test side.* (right) *Control side.*

Table 1 Preoperative Comparisons Between Control (MCAF + SCTG) and Test (MCAF + PRF) Groups

Parameter (mm)	Control group (mean ± SD)	Test group (mean ± SD)	Statistical test	*P*
PD	1.33 ± 0.66	1.47 ± 0.51	Wilcoxon	.421
RD	4.17 ± 0.83	3.93 ± 0.91	Wilcoxon	.223
CAL	5.53 ± 1.07	5.37 ± 1.07	Paired *t* test	.550
KTW	2.60 ± 0.77	2.70 ± 0.70	Paired *t* test	.647
GT	0.69 ± 0.23	0.69 ± 0.21	Paired *t* test	.939

PD = probing depth; RD = recession depth; CAL = clinical attachment level; KTW = keratinized tissue width; GT = gingival thickness.

Table 2 Preoperative and Postoperative Comparisons in Control (MCAF + SCTG) Group

Parameter (mm)	Baseline (mean ± SD)	Postoperative (mean ± SD)	Statistical test	*P*
PD	1.33 ± 0.66	1.17 ± 0.38	Wilcoxon	.244
RD	4.17 ± 0.83	0.68 ± 0.92	Wilcoxon	< .001
CAL	5.53 ± 1.07	1.77 ± 0.97	Wilcoxon	< .001
KTW	2.60 ± 0.77	4.33 ± 0.88	Wilcoxon	< .001
GT	0.69 ± 0.23	0.85 ± 0.21	Wilcoxon	< .001

PD = probing depth; RD = recession depth; CAL = clinical attachment level; KTW = keratinized tissue width; GT = gingival thickness.

Postsurgical Care and Follow-up

Each patient was given postoperative instructions and prescribed analgesics. Plaque control was provided by rinsing with a 0.12% chlorhexidine digluconate solution twice a day. Gentle tooth brushing with a soft-bristle toothbrush was allowed. Sutures were removed 10 days postsurgery. All patients were followed up postoperatively at 1, 3, and 6 months, and oral hygiene instructions were reinforced (Fig 4). Postoperative measurements were taken by a different surgeon.

Statistical Evaluation

Pre- and postoperative comparisons of intra- and intergroup parameters were done using paired *t* test, as was assessment of root coverage between groups. Comparison of complete root coverage percentages between test and control groups were made with McNemar test with Yates correction. Patient VAS scores indicating discomfort during the first postoperative week were compared with Wilcoxon signed rank test. Statistical significance was set at .05.

Results

Preoperative comparison of test and control groups (Table 1) revealed that study parameters were not significantly different in the two surgical sites before the surgeries ($P > .05$). After the operations, no serious morbidities were seen in either group. However,

mild postoperative complications after the SCTG procedure, such as pain, swelling, and bleeding, were observed in the first week postoperative. Comparisons of clinical parameters between and within the groups are shown in Tables 1 to 4.

VAS scores during the first postoperative week were significantly lower in the test group ($P < .001$). Root coverage and complete root coverage percentages can be seen in Fig 5. Mean root coverage was 3.5 mm (SD = 0.68) in the control group and 3.03 mm (SD = 0.56) in the test group ($P = .003$). While root coverage was found to be significantly better in the control group, complete root coverage rates were not statistically different between the two groups ($P = .112$).

Table 3 Preoperative and Postoperative Comparisons in Test (MCAF + PRF) Group

Parameter (mm)	Baseline (mean ± SD)	Postoperative (mean ± SD)	Statistical test	*P*
PD	1.47 ± 0.51	1.17 ± 0.38	Wilcoxon	.004
RD	3.93 ± 0.91	0.90 ± 1.03	Wilcoxon	< .001
CAL	5.37 ± 1.07	2.07 ± 1.17	Wilcoxon	< .001
KTW	2.70 ± 0.70	3.80 ± 0.93	Wilcoxon	< .001
GT	0.69 ± 0.21	0.99 ± 0.20	Wilcoxon	< .001

PD = probing depth; RD = recession depth; CAL = clinical attachment level; KTW = keratinized tissue width; GT = gingival thickness.

Table 4 Postoperative Comparisons Between Control (MCAF + SCTG) and Test (MCAF + PRF) Groups

Parameter (mm)	Control group (mean ± SD)	Test group (mean ± SD)	Statistical test	*P*
PD	1.17 ± 0.38	1.17 ± 0.38	Wilcoxon	1.000
RD	0.68 ± 0.92	0.90 ± 1.03	Wilcoxon	.454
CAL	1.77 ± 0.97	2.07 ± 1.17	Wilcoxon	.465
KTW	4.33 ± 0.88	3.80 ± 0.93	Paired *t* test	.024
GT	0.85 ± 0.21	0.99 ± 0.20	Wilcoxon	.005

PD = probing depth; RD = recession depth; CAL = clinical attachment level; KTW = keratinized tissue width; GT = gingival thickness.

Discussion

The main purpose of mucogingival surgery is to achieve predictable and esthetic root coverage. Total root coverage using SCTG and coronally positioned flap techniques has been reported to be between 70% and 98% in the literature.[23] PRF has also been found to be promising in periodontal plastic surgery for root coverage and esthetics.[24]

In a previous report, root coverage was found to be 75% with PRF and 79% with SCTG, but more postoperative pain was reported in the SCTG group.[19] The present study found similar root coverage of 84% with PRF and 77.12% with SCTG. Han et al[25] observed significantly high postoperative pain levels, especially in the donor site, after SCTG treatment of multiple Miller Class I gingival recessions. Aroca et al[26] stated that patients reported less pain after treatment of multiple gingival recessions with PRF and that this could be explained by the absence of a donor site. In the present study, the SCTG group also had more discomfort, particularly in the donor sites. Avoiding a donor site in the PRF procedure not only decreased pain but also reduced the operation time. In both groups, keratinized tissue gain and root coverage were acceptable.

A 6-month postoperative measurement period is sufficient to evaluate the stability of the gingival margin after SCTG + MCAF.[21] The

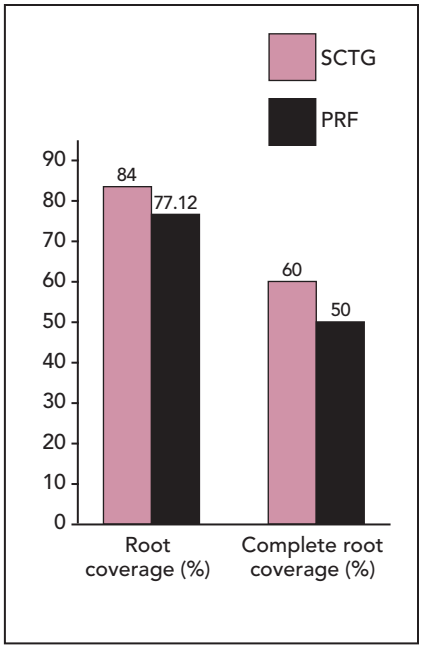

Fig 5 *Root coverage and complete root coverage percentages.*

results of the present study indicated that both PRF + MCAF and SCTG + MCAF techniques produced significant improvement in RD and complete root coverage (60% and 50%, respectively). Complete root coverage ensures recovery from hypersensitivity and esthetic factors associated with recession, and therefore it is associated with predictability. In the present study, many baseline recession defects were deep, and these may have caused the low percentage of complete root coverage in both groups.

Eren and Atilla[21] used a similar approach with PRF. Although their results seem more successful than the present results (complete root coverage of 92.7% with PRF and 94.7% in the control group after 6 months of healing time), they too found no significant difference between the two groups in regard to complete root coverage.

Padma et al[27] treated localized gingival recessions with MCAF alone or PRF + MCAF and concluded that PRF + MCAF treatment provides statistically significant superior root coverage to MCAF alone. However, the present study aimed to evaluate whether PRF + MCAF could be an alternative treatment to SCTG + MCAF. According to the results, no conclusions can be made as to the extent to which the use of PRF improves the clinical outcomes obtained with MCAF alone.

In the present study, as in previous reports, GT values increased significantly in both groups after 6 months.[28] It should be remembered that the initial thickness of the flap and the type of dissection will influence connective tissue microcirculation. Also, the interposition of PRF may restrict the collateral circulation, which is essential for revascularization and healing.[28]

The importance of soft tissue thickness for root coverage with CAF was stressed in systematic reviews on single recessions,[29] but limited information is available for multiple recessions. The increase in KTW in test and control groups in the present study was similar to that found by Eren and Atilla.[28] The increase of KTW in the test group may be explained by the biology of PRF, which contains several growth factors influencing tissue proliferation and manifestation. This statement needs to be confirmed with further histologic studies.

In this study, both treatments resulted in a statistically significant gain in CAL at the end of the study, similar to other reports.[19,28] In a recent study, PRF was demonstrated to be as effective as SCTG for treatment of multiple adjacent recessions.[30] Although better results were achieved with SCTG in the present study, PRF is still suggested in patients who do not have adequate gingival thickness in the donor site or in patients unwilling to undergo a graft harvesting procedure. Furthermore, avoiding the risk of palatinal artery injury and postoperative pain in the donor site are advantages that cannot be easily overlooked.

The present study had some limitations. A histologic examination was not performed to evaluate the regenerative capacity of PRF. Also, the 6-month follow-up period may be considered relatively short because additional healing might occur over longer periods.[31] However, some researchers accept that a 6-month postoperative period is sufficient to evaluate the stability of the gingival margin after a CTG + MCAF procedure.[21] In addition, the size of the presurgical defect affects clinical outcomes by means of root coverage.[32] Many of the baseline recession defects in this study were deep, and these may have negatively influenced the outcomes. These limitations may have been reasons a relatively low percentage of complete root coverage was achieved in both groups.

Conclusions

Both PRF + MCAF and SCTG + MCAF techniques are effective procedures in the treatment of multiple gingival recessions. Although the SCTG technique may provide better results with regard to root coverage, PRF avoids a donor site, which means a major decrease in postoperative discomfort.

Acknowledgments

The author reported no conflicts of interests related to this study.

References

1. Amarante ES, Leknes KN, Skavland J, Lie T. Coronally positioned flap procedures with or without a bioabsorbable membrane in the treatment of human gingival recession. J Periodontol 2000; 71:989–998.

2. Löe H, Anerud A, Boysen H. The natural history of periodontal disease in man: Prevalence, severity, and extent of gingival recession. J Periodontol 1992; 63:489–495.
3. Serino G, Wennström JL, Lindhe J, Eneroth L. The prevalence and distribution of gingival recession in subjects with a high standard of oral hygiene. J Clin Periodontol 1994;21:57–63.
4. Sangnes G. Traumatization of teeth and gingiva related to habitual tooth cleaning procedures. J Clin Periodontol 1976; 3:94–103.
5. Rajapakse PS, McCracken GI, Gwynnett E, Steen ND, Guentsch A, Heasman PA. Does tooth brushing influence the development and progression of non-inflammatory gingival recession? A systematic review. J Clin Periodontol 2007; 34:1046–1061.
6. Miller PD Jr. A classification of marginal tissue recession. Int J Periodontics Restorative Dent 1985;5:8–13.
7. Needleman I, Moles DR, Worthington H. Evidence-based periodontology, systematic reviews and research quality. Periodontol 2000 2005;37:12–28.
8. Müller HP, Eger T, Schorb A. Gingival dimensions after root coverage with free connective tissue grafts. J Clin Periodontol 1998;25:424–430.
9. Cairo F, Pagliaro U, Nieri M. Treatment of gingival recession with coronally advanced flap procedures: A systematic review. J Clin Periodontol 2008;35: 136–162.
10. Cairo F, Rotundo R, Miller PD, Pini Prato GP. Root coverage esthetic score: A system to evaluate the esthetic outcome of the treatment of gingival recession through evaluation of clinical cases. J Periodontol 2009;80:705–710.
11. Bouchard P, Malet J, Borghetti A. Decision-making in aesthetics: Root coverage revisited. Periodontol 2000 2001; 27:97–120.
12. Greenwell H, Bissada NF, Henderson RD, Dodge JR. The deceptive nature of root coverage results. J Periodontol 2000;71: 1327–1337.
13. Wennstrom JL, Pini Prato GP. Mucogingival therapy. In: Lindhe J, Karring T, Lang NP (eds). Clinical Periodontology and Implant Dentistry. Copenhagen: Munksgaard, 1998:550–596.
14. Choukroun J, Diss A, Simonpieri A, et al. Platelet-rich fibrin (PRF): A second-generation platelet concentrate. Part V: Histologic evaluations of PRF effects on bone allograft maturation in sinus lift. Oral Surg Oral Med Oral Pathol Oral Radiol Endod 2006;101:299–303.
15. Dohan DM, Choukroun J, Diss A, et al. Platelet-rich fibrin (PRF): A second-generation platelet concentrate. Part II: Platelet-related biologic features. Oral Surg Oral Med Oral Pathol Oral Radiol Endod 2006;101:e45–e50.
16. Dohan DM, Choukroun J, Diss A, et al. Platelet-rich fibrin (PRF): A second-generation platelet concentrate. Part I: Technological concepts and evolution. Oral Surg Oral Med Oral Pathol Oral Radiol Endod 2006;101:e37–e44.
17. Choukroun J, Diss A, Simonpieri A, et al. Platelet-rich fibrin (PRF): A second-generation platelet concentrate. Part IV: Clinical effects on tissue healing. Oral Surg Oral Med Oral Pathol Oral Radiol Endod 2006;101:e56–e60.
18. McGuire MK, Cochran DL. Evaluation of human recession defects treated with coronally advanced flaps and either enamel matrix derivative or connective tissue. Part 2: Histological evaluation. J Periodontol 2003;74:1126–1135.
19. Jankovic S, Aleksic Z, Klokkevold P, et al. Use of platelet-rich fibrin membrane following treatment of gingival recession: A randomized clinical trial. Int J Periodontics Restorative Dent 2012;32:e41–e50.
20. Cheng YF, Chen JW, Lin SJ, Lu HK. Is coronally positioned flap procedure adjunct with enamel matrix derivative or root conditioning a relevant predictor for achieving root coverage? A systemic review. J Periodontal Res 2007;42:474–485.
21. Eren G, Atilla G. Platelet-rich fibrin in the treatment of localized gingival recessions: A split-mouth randomized clinical trial. Clin Oral Investig 2014;18:1941–1948.
22. Zucchelli G, De Sanctis M. Treatment of multiple recession-type defects in patients with esthetic demands. J Periodontol 2000;71:1506–1514.
23. Clauser C, Nieri M, Franceschi D, Pagliaro U, Pini-Prato G. Evidence-based mucogingival therapy. Part 2: Ordinary and individual patient data meta-analyses of surgical treatment of recession using complete root coverage as the outcome variable. J Periodontol 2003;74:741–756.
24. Trombelli L, Scabbia A, Tatakis DN, Calura G. Subpedicle connective tissue graft versus guided tissue regeneration with bioabsorbable membrane in the treatment of human gingival recession defects. J Periodontol 1998;69: 1271–1277.
25. Han JS, John V, Blanchard SB, Kowolik MJ, Eckert GJ. Changes in gingival dimensions following connective tissue grafts for root coverage: Comparison of two procedures. J Periodontol 2008; 79:1346–1354.
26. Aroca S, Keglevich T, Barbieri B, Gera I, Etienne D. Clinical evaluation of a modified coronally advanced flap alone or in combination with a platelet-rich fibrin membrane for the treatment of adjacent multiple gingival recessions: A 6-month study. J Periodontol 2009;80:244–252.
27. Padma R, Shilpa A, Kumar PA, Nagasri M, Kumar C, Sreedhar A. A split mouth randomized controlled study to evaluate the adjunctive effect of platelet-rich fibrin to coronally advanced flap in Miller's class-I and II recession defects. J Indian Soc Periodontol 2013;17:631–636.
28. Eren G, Atilla G. Platelet-rich fibrin in the treatment of bilateral gingival recessions. Clin Adv Periodontics 2012;2:154–160.
29. McGuire MK, Scheyer ET, Nevins ML, et al. Living cellular construct for increasing the width of keratinized gingiva: Results from a randomized, within-patient, controlled trial. J Periodontol 2011;82: 1414–1423.
30. Tunalı M, Özdemir H, Arabacı T, Gürbüzer B, Pidöken L, Firatli E. Clinical evaluation of autologous platelet-rich fibrin in the treatment of multiple adjacent gingival recession defects: A 12-month study. Int J Periodontics Restorative Dent 2015; 35:105–114.
31. Kimble KM, Eber RM, Soehren S, Shyr Y, Wang HL. Treatment of gingival recession using a collagen membrane with or without the use of demineralized freeze-dried bone allograft for space maintenance. J Periodontol 2004;75:210–220.
32. Harris RJ, Harris AW. The coronally positioned pedicle graft with inlaid margins: A predictable method of obtaining root coverage of shallow defects. Int J Periodontics Restorative Dent 1994:14: 228–241.